

Methane Emissions : Detection, Quantification and Mitigation



Society of Petroleum Engineers

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global **environmental** and **advisory** solutions



Topics *(for the Natural Gas Supply Chain)*

- **Methane Measurement**
- **Methane Reduction/Mitigation**
 - Trends/Resources
 - Things to watch

The World of Methane Emissions Inventories

- **Up until now, a Slow Evolution**
 - Evolution from voluntary inventories to national reporting programs with emission factor-based inventories
 - Growth in EF improvements largely based on regional or larger super-studies
- **Under-Reporting.** Majority of regional studies in north America in the past 10 years show more methane emitted than reported. So Bottom up emissions inventories need to be validated by actual macro level measurements.
- **Only Voluntary Efforts.** Measurements up to this point have mostly been voluntary. Most have been implemented without specific standards
- **Regulatory drivers continue to increase** (USA examples follow)
 - USA SEC Disclosures (and other ESG reporting pressures)
 - USA Inflation Reduction Act 2022, which required the US EPA to issue a modification to GHG Reporting that incorporates addition of empirical data within 2 years
 - State rules

The World of Methane Emissions Inventories

What is changing?:

- **Many new rate measurement techniques evolving**
 - list of widely used new technologies includes:
 - Local Detection and Quantification.....*handheld devices*
 - Optical Gas Imaging (OGI) and Q-OGI post processing
 - Generation 2 HiFlow samplers
 - Aerial Detection and Quantification:
 - Plume Identification (LIDAR or IR/spectroscopy)...*mostly aircraft*
 - Mass Balance curtains....*aircraft and drones*
 - Satellite spectroscopy
 - Continuous Monitoring Systems (fixed location concentration sensors and other systems)

The World of Methane Emissions Inventories

Verification Measurement is Coming

- What this means: paper inventories will no longer be solely sufficient
- New Initiatives that guide reconciliations between paper inventories and larger scale measurements
 - Emerging Guidelines and Protocols:
 - **OGMP 2.0**
 - **Veritas**
 - **QMRV**
 - Reconciliation will be a large issue
 - Handling discontinuous emissions
- Consequences: Voluntary reduction commitments may have been made at the wrong starting point, or might require a much larger lift



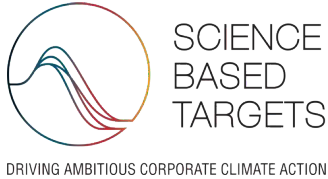
The World of Methane Emissions Inventories

Remaining Issues to Resolve

- Still some inadequately characterized sources (uncharacterized discontinuous emission events, marginal wells, orphaned wells, post customer meter emissions)
- Consistent underestimation shown in bottom-up vs top-down in some regions....needs to be reconciled
- Discontinuous emissions and superemitters are issues
- Guidelines for use of measured data, especially CMS
- Handling of actual measurement uncertainties
- New measurements are slow to be incorporated into reporting programs

The World of Methane Reduction Efforts

- Up until now:
 - Regulatory drivers: cap&trade, carbon tax, regulatory required controls, etc.
 - Voluntary commitments made by each company
 - Participation in voluntary programs
 - List of voluntary program examples (see next slide)



The World of Methane Reduction Efforts

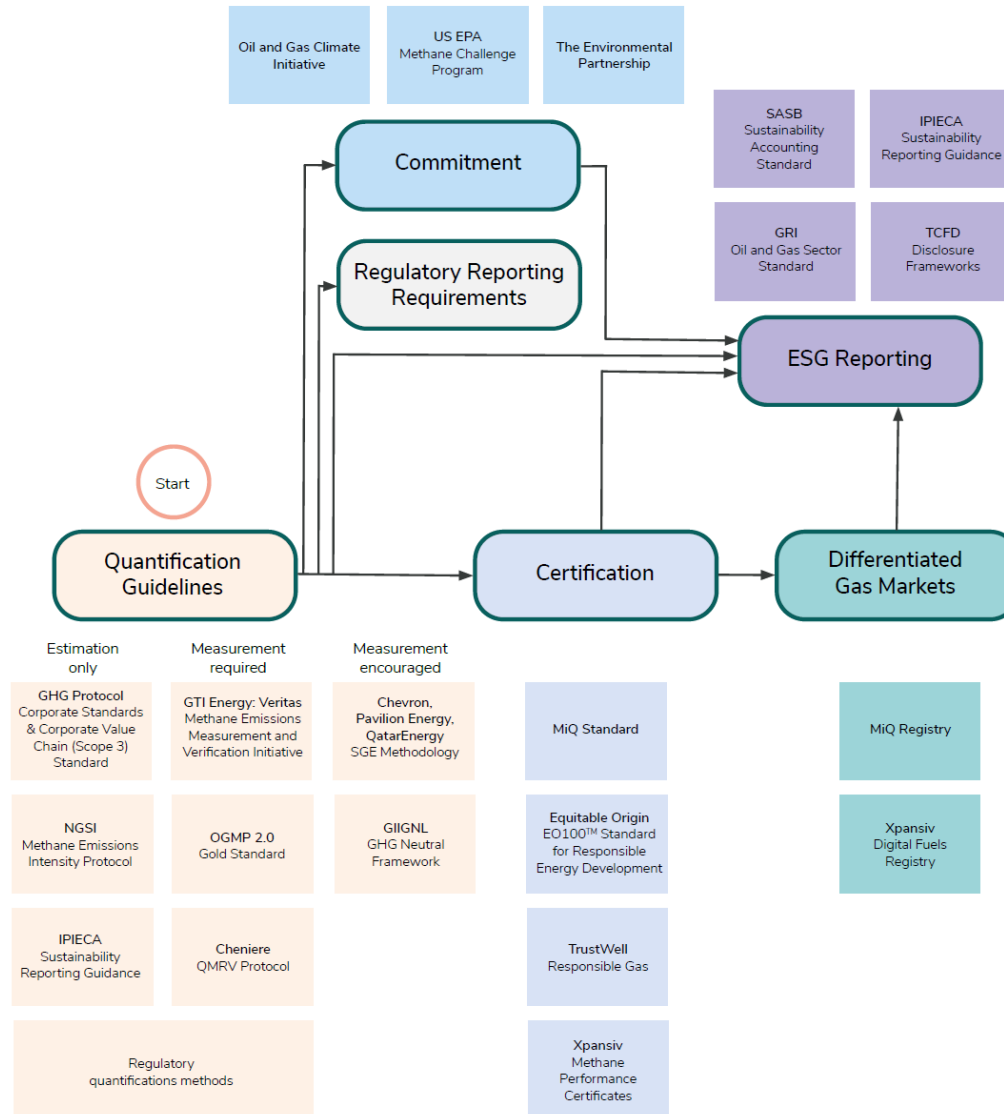
- What is coming:
 - Potential Methane Intensity control targets
 - US Existing Source Control regulations (State regs can still be more cutting edge)
 - Demand for transparency
 - Verification Measurement is Coming.
 - What this means: Voluntary reduction commitments may have been made at the wrong starting point, and consequently might require a much larger lift than originally envisioned

Conclusions

What is left to resolve in the future?

- Commitments on reductions will drive additional projects, both measurement and reduction
- Achieving net zero will always require some offsets in natural gas systems
- Harmonizing the various initiatives, guidelines, and standards
- Standard use of emission measurement technologies that have been rapidly developing. A challenge globally.
- Reconciliation and Data Management

Example: Program Relationships suggested by Highwoods



Resources

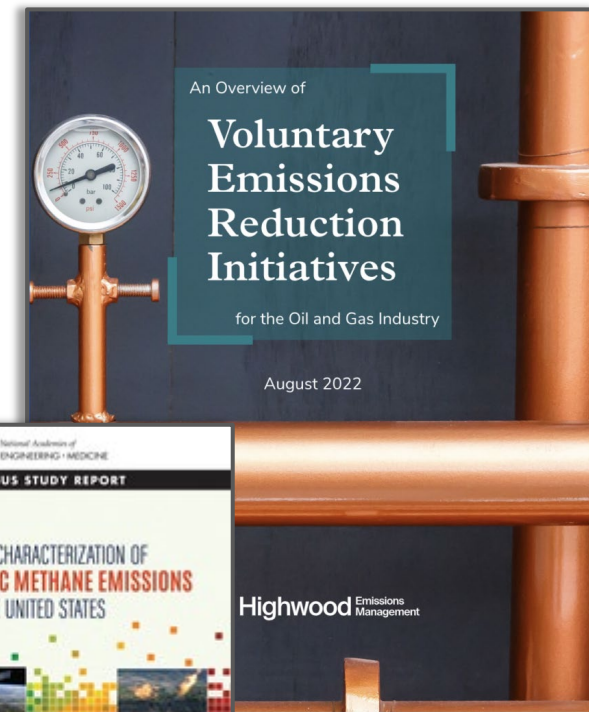
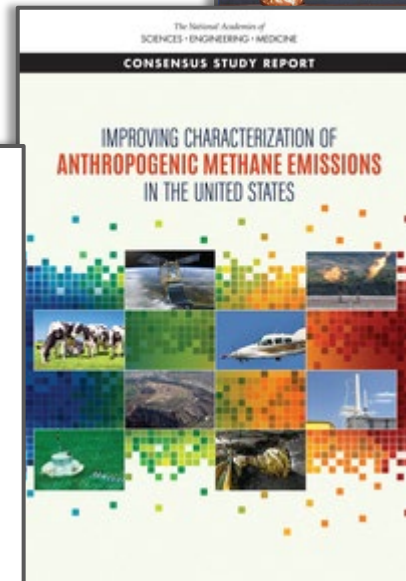
- Highwoods latest programs report [Link](#)
- National Academies Report (and *Update in progress 2022*) [Link](#)
- Libraries of Other Programs: MGP, [Link](#) OGMP 2.0 [Link](#)
- Methane Focused Conferences



Mineral Methane Initiative
OGMP2.0 Framework

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Q&A

